

Fever



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Fever

Definitions

- Fever – elevation of body temperature due to a resetting of the hypothalamic thermoregulatory center
- Hyperthermia – elevation of body temperature due to inadequate compensation by normal heat-loss mechanisms

Definitions (cont.)

Fever

- Hyperpyrexia – elevation of temperature to unusually high levels, 105.8°F (41 °C) or higher
- Fever Without a Focus – fever with no clear cause determined by history and/or physical exam
- Fever of Unknown Origin (FUO) – prolonged fever lasting over 7 – 10 days without identified cause

Definitions (cont.)

Fever

What is a “normal” temperature?

- Nothing “magic” about 98.6°F (37°C)
- Upper limit of normal extends to 100.2°F (37.9°C) in children
- Person-to-person variations of “normal”
- Circadian variations of “normal”
- 100.4°F (38.0°C) or above is considered a fever

Fever

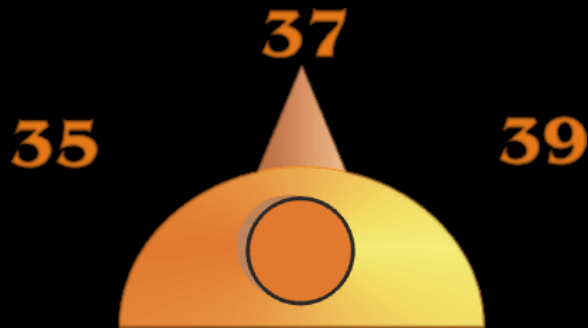
- Common: Viruses, bacteria
- Less common: Immune complexes –
i.e. autoimmune
disease Tumor cells –
malignancy

- Cytokines reset the hypothalamic “thermostat” to a higher set-point.

Pathophysiology of Fever

Fever

Analogy to the thermostat on your
home's heater



In a normal
equilibrium,
the
thermostat is
set to an
“ideal” or
“normal”
temperature



Pathophysiology of Fever

Fever

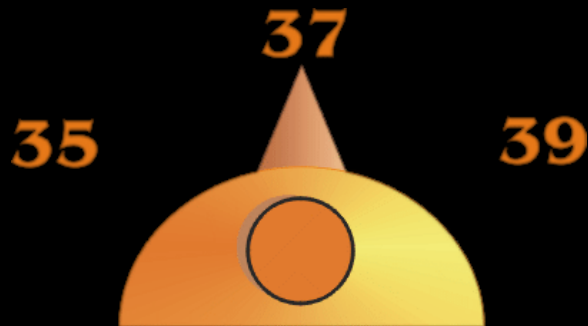
When someone turns the thermostat up, the furnace comes on, and the temperature begins to rise:



Pathophysiology of Fever

Fever

Similarly, in the human, when a pyrogen resets the hypothalamic “thermostat”, the body’s “furnace” comes on, and the temperature rises:



- Shivering
- Goose bumps
- Cutaneous vasoconstriction
- Sensation of “feeling cold”



Pathophysiology of Fever

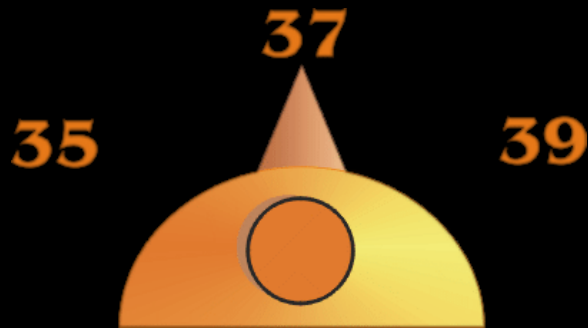
Fever

- The symptoms of shivering, goose bumps, cutaneous vasoconstriction (cold, pale hands and feet), and a sensation of feeling cold are collectively known as “chills”
- Chills occur when the fever is rising

Pathophysiology of Fever

Fever

Continuing the analogy to your
home thermostat:



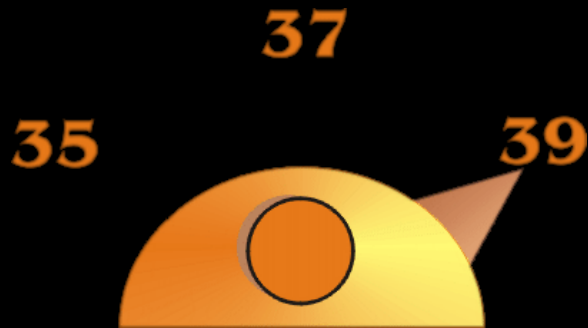
When the
thermostat is
reset to
“normal”, the
furnace goes
off and the
house cools



Pathophysiology of Fever

Fever

When the hypothalamic “thermostat” is reset to “normal” (such as when antipyretic medication is given, or the illness ends), the body begins to cool and the temperature returns to normal:



- Sweating
- Cutaneous vasodilatation
- Sensation of “feeling hot”



Pathophysiology of Fever

Fever

- The symptoms of sweating, cutaneous vasodilation (warm, red skin), and a sensation of feeling hot are collectively called “sweats”
- Sweats occur when the fever is breaking

Management

Fever

- Goal – to identify potentially serious or life-threatening illness that may present without symptoms or physical findings confirming a clear-cut focal source for the fever
- Two age groups addressed separately:
 - Birth to 3 months (neonate)
 - 3 to 36 months

Management - neonate

Fever

- Neonate = first 90 days

Due to the immaturity of the immune system, any suspected bacterial infection is sepsis until proved otherwise

Management - neonate

Fever

- Any fever $>100.4^{\circ}\text{F}$ (38°C) needs to be investigated
- History of fever without clinic confirmation is valid – **if** the parent has measured and can cite the number

Management - neonate

Fever

- 10% will have serious occult bacterial illness:
 - 3.6% meningitis / bacteremia
 - 2.3% urinary tract infection
 - 2.6% enteric pathogen
 - 2.0% soft-tissue infection

Management - neonate

Fever

- Causes include Gram-negative organisms, group B Strep, enterococci, in addition to common organisms in older children (*Hemophilus influenzae*, *Streptococcus pneumoniae*, group A Strep)

Management - neonate

Fever

- Evaluation

CBC

Blood culture

Catheterized urine for UA and culture

Lumbar puncture *

* Some authors divide this age group into those under 6 weeks and those over 6 weeks, and with clinical discretion in the decision to perform an LP in the over 6 week range

Management - neonate

Fever

- Evaluation

CBC

Blood culture

Catheterized urine for UA and culture

Lumbar puncture

Stool culture or CXR if clinically
indicated

Management - neonate

Fever

- Since CBC and UA may be unrevealing, presumptive antibiotic therapy is indicated pending initial culture results
- Under one month – admit for IV antibiotics (ampicillin and cefotaxime)
- One to 3 months and clinically stable can be managed at home with daily follow-up, IV or IM ceftriaxone

Management – 3-36 month

Fever

- Any fever $>102^{\circ}\text{F}$ (38.9°C) without a focus to explain the fever should have at least a catheterized urine for UA and culture
- Depending on clinical presentation, consider CBC and blood culture
- Any fever $>104^{\circ}\text{F}$ (40°C) should receive CBC and blood culture in addition to a catheterized urine
- LP, CXR, stool cultures need to be considered if clinically indicated

Management – 3-36 month

Fever

- Empiric antibiotics indicated for:
 - WBC $>15,000$ and/or ANC $>10,000$
 - Pyuria > 10 per HPF

Fever

Management

Hyperpyrexia

- Temperature of 105.8°F (41°C) or greater
- Associated with a higher incidence of CNS disruption, such as meningitis or encephalitis
- Can also occur in the face of CNS tumors, intracranial hematomas, and chronic brain defects

Fever

Fever Phobia

- Survey done in 1980 by Dr. Barton Schmitt
- Population 50% indigent, 40% part-pay, 10% full-pay
- 57% had one child, 32% had two, 11% with more
- 14% had only child under 6 months

Fever

Fever Phobia

Summary:

- 58% of parents consider a fever of 102°F (38.9°C) **or less** to be a “high fever”
- 62% of parents believe fever can cause permanent harm (most commonly “brain damage”)
- 56% of parents give antipyretic medication for temperatures of 99.8°F (37.8°C) **or less** (i.e. for normal temperatures)
- 51% of parents credit health-care providers as their main source of information about fever

Fever

Fever Phobia

Are there reasons to treat fever?

- Discomfort – occurs in children generally above 102°F (38.9°C) – 103°F (39.4°C)
- A child may appear more ill than (s)he really is
- Increased insensible water loss

Fever

Fever Phobia

Are there reasons to treat fever?

- Febrile seizures (?)
- There is no evidence that aggressive antipyretic therapy lowers risk

Fever

Fever Phobia

Are there reasons not to treat fever?

- Fever may be of some value in decreasing duration of illness – studies limited
- Fever therapy results in unnecessary cycles of sweats (as meds begin to work), and chills (as meds wear off and fever returns)
- Potential for serious, life-threatening acetaminophen toxicity even from low-level overdose

Fever

Fever Phobia

Why should health providers deal with fever phobia?

- Emphasis on “fever control” by health providers may cause parents to focus on the number on the thermometer, and neglect other, more significant symptoms (decreased alertness, respiratory difficulty, refusal to drink, etc.)

Fever

Fever Phobia

Why should health providers deal with fever phobia?

- Recall that 51% of parents credit health-care providers as their main source of information about fever
- In the same survey, parents who credited their source of knowledge about fever to **reading** gave more appropriate responses than those who credited health-care providers

Fever

Fever Phobia

How should health providers deal with fever phobia?

- Assume and encourage a calm approach to fever
- Avoid overly aggressive fever therapy
- Antipyretic medication generally only warranted for fever of 102°F (38.9°C) or higher, and only if there is associated discomfort
- Sponge baths are generally not warranted
- Alternating 'round-the-clock acetaminophen and ibuprofen, or any 'round-the-clock antipyretic is unwarranted

Questions and Discussion

Fever

References:

- Schmitt BD. Fever Phobia. *Am J Dis Child* 134:176-181, 1980
- McCarthy PL. Fever. *Pediatrics in Review* 19:401-408, 1998
- Heubi JE, Barbacci MB, Zimmerman HJ. Therapeutic misadventures with acetaminophen: Hepatotoxicity after multiple doses in children. *J Pediatr* 132:22-27, 1998